SpectraLink
Wireless@work™

NetLink e340/i640 Wireless Telephone

NetLink Telephony Gateway and SpectraLink Radio Protocol (SRP)

Setup and Administration

Part Number: 72-1065-09
Issue E

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Note concerning shielded cable:

SpectraLink recommends the use of shielded cable for all external signal connections in order to maintain FCC Part 15 emissions requirements.

Note concerning the NetLink Wireless Telephones:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING Changes or modifications to this equipment not approved by SpectraLink Corporation may cause this equipment to not comply with part 15 of the FCC rules and void the user's authority to operate this equipment.

WARNING SpectraLink products contain no user-serviceable parts inside. Refer servicing to qualified service personnel.

Please visit Spectralink.com to view regulatory declarations.

Important Safety Information

Follow these general precautions while installing telephone equipment:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

FCC Information

The NetLink 150 Telephony Gateway complies with Part 68, FCC Rules
FCC Registration Number IYGUSA-33816-PX-E
Ringer Equivalence 0.3B
SpectraLink Corporation
NetLink Wireless Telephones
Made in the USA

This equipment complies with Part 68 of the FCC Rules. On the back of this equipment is a label that contains, among other information, the FCC Registration Number and Ringer Equivalence Number (REN) for this equipment. If requested, this information must be given to the telephone company.

This equipment uses RJ-21 connectors.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all of those devices ring when your number is called. In most, but not all, areas, the sum of the RENs of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

If your telephone equipment causes harm to the telephone network, the telephone service may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

If you experience trouble with this telephone equipment, please contact SpectraLink Corporation for information on obtaining service or repairs.
SpectraLink Corporation
5755 Central Avenue
Boulder, CO 80301
303-440-5330

The telephone company may ask that you disconnect this equipment from the network until the problem has been corrected or until you are sure that the equipment is not malfunctioning. There are no user serviceable parts in this equipment.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

Industry Canada (IC) Notice

Notice:

The Industry Canada (IC) label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational, and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by a user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Notice: The Ringer Equivalence Number (REN) assigned to each terminal device provides as indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination of an interface may consist of any combination of devices.

REN 0.3B
Approval Numbers:
2128-9760 A

Warranty and Repair Service Center:

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DOC Spread Spectrum certification

Wireless Telephone Cert. No. 2128-K1374

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1. About This Document

This document explains how to configure and maintain the NetLink e340 and i640 Wireless Telephones when used with the NetLink Telephony Gateway.

1.1 Contacting SpectraLink

SpectraLink wants you to have a successful installation. If you have questions please contact our **Customer Support Hotline at (800) 775-5330.** The Hotline is open Monday through Friday, 6:00 AM to 6:00 PM Mountain Time.

1.2 Icons and Conventions

This manual uses the following icons and conventions.

Caution! Follow these instructions carefully to avoid danger.

Note these instructions carefully.

NORM This typeface indicates a key, label, or button on SpectraLink hardware.

2. NetLink Wireless Telephone Overview

The NetLink e340 and i640 Wireless Telephones are mobile handsets for workplace telephone systems. The Wireless Telephone operates over an 802.11b (802.11 for FH) wireless Ethernet LAN providing users a wireless voice over IP (VoIP) extension. By seamlessly integrating with the NetLink Telephony Gateway and the site PBX, Wireless Telephone users are provided with high-quality mobile voice communications throughout the workplace. The Wireless Telephone gives users the freedom to roam throughout the workplace while providing all the features and functionality of a desk phone.

The Wireless Telephones reside on the wireless LAN with other wireless devices using Direct Sequence (DS) or Frequency Hopping (FH) Spread Spectrum radio technology. The handset radio transmits and receives packets at up to 11Mb/s.

When the system employs four or fewer NetLink Telephony Gateways and no NetLink SVP Server, the NetLink Telephony Gateways provide SpectraLink Voice Priority (SVP). SVP is required for handling voice packets on an 802.11 WLAN. In this configuration the NetLink Wireless Telephones are limited to a maximum of 2Mb/s. If the 11Mb/s transmission rate is desired, a NetLink SVP Server must be added to the system.

The NetLink Wireless Telephone supports Wired Equivalent Privacy (WEP) as defined by the 802.11 specification. SpectraLink offers the product with both 40-bit and 128-bit encryption. WEP increases the security of the wireless LAN to a level similar to a wired Ethernet LAN.

IP multicast addresses are used by the NetLink i640 Wireless Telephone. This requires that multicasting be enabled on the subnet used for the NetLink Wireless Telephones, SVP Server, and Telephony Gateways.

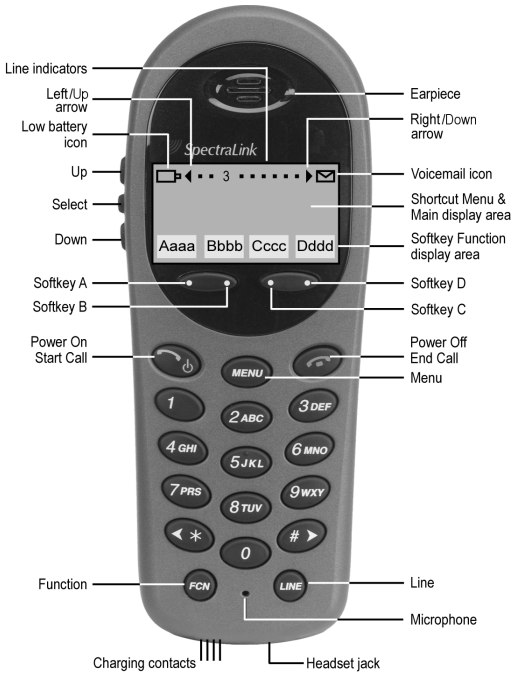
Routers are typically configured with filters to prevent multicast traffic from flowing outside of specific domains. The wireless LAN can be placed on a separate VLAN or subnet to reduce the effects of broadcast and multicast traffic from devices in other network segments.

All SpectraLink products use our LinkPlus digital integration technology to integrate with various digital switch platforms. Using LinkPlus technology, Wireless Telephones emulate digital telephone sets to deliver advanced capabilities such as multiple line appearances and LCD display features. See the *LinkPlus Interface Guide* for your PBX for information about mapping the PBX features to the Wireless Telephone.

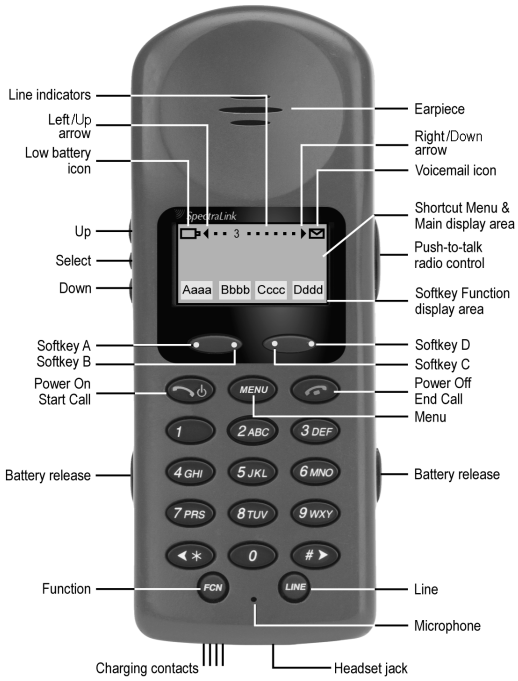
2.1 Quick Start Guide

1. A wireless LAN must be properly configured and operational through the use of 802.11b wireless access points (APs).
2. A NetLink Telephony Gateway must be available on the network and the handset must be registered to it in order to load the appropriate software into the Wireless Telephones. Most installations choose to take advantage of the TFTP Server that accompanies the NetLink Telephony Gateway, making a separate TFTP Server unnecessary.
3. The NetLink Telephony Gateway or NetLink SVP Server, which controls the QoS on the wireless LAN for the Wireless Telephones, must be on the same subnet as the Wireless Telephones and have the proper versions of software.
4. Download software: Download the correct NetLink Wireless Telephone software per Section 4.2 *Configuration Process*. Ensure the software is properly loaded on the NetLink Telephony Gateway, or a separate TFTP server. Download updates to the NetLink SVP Server software (if the NetLink SVP Server is installed) per *NetLink SVP Server Installation, Setup and Maintenance* Section 6.1 *Software Updates* (72-0178-00). Download updates to the NetLink Telephony Gateway software per *NetLink Telephony Gateway Setup and Administration* document, Section 14 *Software Maintenance* Section 14.
5. Configure your Wireless Telephone to ensure that it associates with the wireless LAN, has the appropriate software and is registered to the appropriate NetLink Telephony Gateway.

2.2 The NetLink e340/i640 Wireless Telephone Specifications



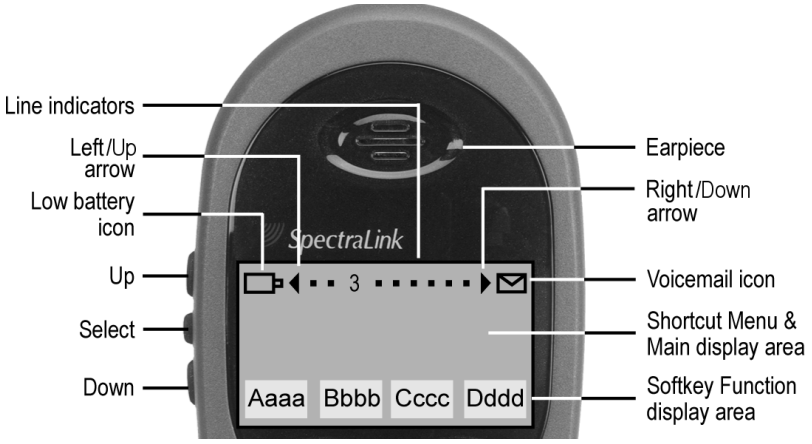
NetLink e340 Wireless Telephone



NetLink i640 Wireless Telephone

Radio frequency	2.4000 – 2.4835 GHz
Transmission type	Direct Sequence Spread Spectrum (DSSS)
Transmit data rate	Up to 11 Mb/s
Radio QoS	SpectraLink Voice Priority (SVP)
Wireless security	Wired Equivalent Privacy (WEP), 40-bit and 128-bit; Cisco FSR
FCC certification	Part 15.247
Management	DHCP, TFTP
Voice encoding	ADPCM (Proprietary)
Transmit power	100 mW peak, < 10 mW average
Display	Pixel-based (up to 4-line x 18-character) alphanumeric, plus line and status indicators
e340 Dimensions	5.5” x 2.0” x 0.9” (14.0 x 5.1 x 2.3 cm)
i640 Dimensions	5.9” x 2.2” x 1.0” (15.0 x 5.6 x 2.5 cm)
e340 Weight	4.2 ounces (119.0 g)
i640 Weight	6.0 ounces (170.1 g)
Battery capacity	4 hours talk time, 80 hours standby

2.3 The Wireless Telephone Display



See the *LinkPlus Interface Guide* for your PBX for information about how the Wireless Telephone emulates the features of the PBX utilized at your site. The following general explanations may not apply due to differences in PBX configurations.

Alphanumeric

Display information provided by the PBX when the Wireless Telephone is off-hook will be passed directly to the Wireless Telephone Main display. Certain characters may be used by the PBX that are not implemented in the Wireless Telephone such as definable and special characters.

Voicemail Icon

The Voicemail icon is activated when a new voice mail message is received if the feature is supported by the phone emulation.

Ringing and Tones

The ringing type (normal or vibrate) is selected by the Wireless Telephone user and are not accessible or changeable by the PBX. Whenever possible the audible and vibrating ringer on the Wireless Telephone will follow the protocol command provided by the PBX.

Audio Features

Speakerphone features are not available on the Wireless Telephone.

Line Indicators

The Line Indicator bullets on the Wireless Telephone will convert to a solid or flashing number to mimic the Line LEDs on the deskset, based on the assignment made at the PBX.

2.4 Startup Sequence

The Wireless Telephone goes through an initialization sequence at startup. The line icons 1-9 display and count down as the Wireless Telephone steps through this sequence. This is usually very rapid. If there is any difficulty at any step that prevents initialization from continuing, an error message will display and the associated icon(s) will stay on. Please see the error table at the back of this document for instructions on how to handle error messages that occur during initialization.

Icon	**The icon(s) shown in bold turns off when:**
123456789	The Wireless Telephone has located and authenticated and associated with at least one AP, and is proceeding to bring up higher-layer networking functions.
1234567**8**	The Wireless Telephone is either configured for Static IP, or if configured for DHCP the DHCP discovery process has started.
123456**7**	If DHCP is configured, a DHCP response was received which contains a good DNS server configuration.
12345**6**	Note: Only valid on non-SRP protocol. Indicates one of the following: Static IP configuration, or SVP Server address found in DHCP response, or SVP Server address found via DNS lookup.
1234**5**	All networking functions are complete (notably, DHCP) and the Wireless Telephone is proceeding with establishing the SRP link to either the Gateway or SVP Server.
123**4**	The SRP link is established, all network stack initialization is complete, proceeding with application-specific initialization.
123	The link between the Wireless Telephone and the SVP Server is established.
(no icons) **EXT. XXX**	Initialization is complete. The Wireless Telephone is in standby mode ready to receive and place calls.

2.5 Wireless Telephone Modes

Standby (on-hook)

In the standby mode the Wireless Telephone is waiting for an incoming call or for the user to place an outgoing call. The extension number is shown on the display and there is no dial tone. In this mode, the Wireless Telephone is conserving battery power and wireless LAN bandwidth.

When an incoming call occurs the handset enters a transitional state and will ring loudly until the call is answered or the **End Call** key is pressed to silence the ringing.

Active (off-hook)

To place a call, press the **Start Call** key. This transitions the Wireless Telephone to active off-hook mode. There is a dial tone, the Wireless Telephone is in communication with the PBX, and the display shows information as it is received from the PBX. The user may place a call or press the **FCN** or **LINE** key to access operations.

The Wireless Telephone is also in the active mode when an incoming call is answered.

When an incoming call occurs during an active call the handset will play the second line ringing sound until the call is answered, the caller hangs up, or the call transfers to voice mail. If **End Call** is pressed, the first call is terminated and the handset reverts to a full ring.

The active modes utilize the most bandwidth and battery power. To conserve these resources, return the Wireless Telephone to the standby mode when a call is completed by pressing the **End Call** key.

2.6 Wireless Telephone Displays

Status display

Displays information from the PBX in two lines of text and displays available softkeys in the softkey display area. The PBX text may be truncated as some PBXs send 24 characters and the Wireless Telephone display area is 16 characters.

LINE display

Most, but not all, PBXs allow for more than one line appearance. In most cases, pressing the **LINE** key from the active mode displays the list of line appearances extracted from the PBX. The line appearances are also mapped to corresponding line icons across the top of the Wireless Telephone display.

Menu display

Most, but not all, PBXs have expanded features that are programmed to the softkeys on the Wireless Telephone. Pressing the **MENU** key from the active state displays the full list of features that have been programmed to the softkeys and their shortcut. OAI features, if assigned, will also be displayed with their shortcuts.

FCN display

The **FCN** key is used to scroll through the softkey display area. Pressing the **FCN** key will display the next level of programmed softkeys. Pressing it repeatedly will scroll through all four levels, or as many levels as have been programmed.

3. NetLink e340 and i640 Wireless Telephone Configuration

Prior to configuring a NetLink e340 or i640 Wireless Telephone, it must be associated with one and only one line on one of the NetLink Telephony Gateways. Then it must be configured per the instructions in this section. The following instructions assume that the Wireless Telephone has been properly associated with a line on a NetLink Telephony Gateway. See *NetLink Telephony Gateway: Setup and Maintenance: Telephone Line Configuration* for additional information. While Wireless Telephones are being associated, the system will continue normal operation.

Use the *Wireless Device Planning Worksheets* filled out by the network or system administrator to be sure you are correctly assigning telephone parameters.

3.1 The Admin Menu

The Admin menu contains configuration options that are stored locally (on each Wireless Telephone). Every Wireless Telephone is independently configured and if the default settings are not desired, the admin options must be set in each Wireless Telephone requiring different settings.

Opening the Admin Menu

1. With the Wireless Telephone powered OFF, simultaneously press and hold the **Power On** and **Power Off** keys.
2. Release the **Power On** key, wait for a single beep, then release the **Power Off** key. The first option on the Admin menu displays.

If an admin password has been set, the display will require its entry before opening the Admin menu. If no password is set, the display will proceed directly into the Admin menu.

Entering and editing Admin Menu options

An asterisk (*) next to an option indicates that it is selected. The default settings are shown in the table below with an * prior to the option. Use the **Up**, **Down**, and **Select** side buttons and the softkeys to navigate and select:

Up/**Down** buttons:	display previous/next menu item.
Select button:	selects the menu item or option.
OK softkey	selects the menu item or option.
Save softkey:	saves the entry.
Bksp softkey:	backspaces to allow editing of entry.
Cncl softkey:	cancels edit and returns to previous menu level.
Up softkey:	returns to previous menu level.
Exit softkey:	exits the menu (at the top level).
End Call key:	exits to standby state (from any level)

Alphanumeric String Entry

1. Press the first digit/letter. The digit displays. Press the key again to scroll through the letters associated with that key.

   Example: if you press 2 repeatedly, you will see 2, A, B, and C, a, b, and c.

   The following table shows which key will allow you to enter non-numeric characters or other characters not represented on the keypad.

To Enter	Press
. - _ ! # $ % & ‘ ( ) , : ; / \ = @ ~	1
Space	0
Q,q	7
Z,z	9

2. When the correct entry displays, press Right Arrow to move on to the next character. Repeat for each digit/letter of the entry. To erase, press the Left Arrow or **Bksp** softkey to erase the previous character.
3. Press the **Save** softkey to save the entry.
   Press the **Cncl** softkey to abort and return to the menu without saving any changes.

The following table lists the Admin menu items. Detailed descriptions of each item appear below the table.

Admin Menu Items	**2nd Level**	**3rd Level**	**4th Level**
IP Address	*Use DHCP		
	Static IP	Phone IP Default Gateway Subnet Mask	
ESS ID	Static Entry		
	*Learn Once		
	Learn Always		
License Management	Set Current		
Restore Defaults			
Site Survey Mode			
Regulatory Domain			
Security	*None		
	WEP	Authentication	Open System Shared Key
		WEP On/Off	
		Key Information	Default Key Key Length Key 1-4
		Rotation Secret	
	Cisco FSR	Username Password	
Admin PW			

IP Address

Select the setting for IP address configuration:

*** Use DHCP**: will use Dynamic Host Configuration Protocol to assign an IP address each time the Wireless Telephone is turned on.

Static IP: allows you to manually set a fixed IP address. If selected, the next options will prompt you to enter the IP addresses designated for this Wireless Telephone. Enter the digits only, including leading zeroes. No periods required.

Phone IP – the IP address of the Wireless Telephone. This is automatically assigned if DHCP is used. If using Static IP configuration, you must obtain a unique IP address for each Wireless Telephone from your network administrator.

The following components may be configured optionally:

Default Gateway and Subnet Mask – used to identify subnets, when using a complex network which includes routers. Both of these must be configured (not set to 0.0.0.0 or 255.255.255.255) for the Wireless Telephone to contact any network components on a different subnet. They can be set using either Static IP configuration or via DHCP options 3 (Default Gateway) and 1 (Subnet Mask) respectively. Contact your network administrator for the proper settings for your network. Note that the Wireless Telephones cannot "roam" across subnets, since they cannot change their IP address while operational. Ensure that all your access points are attached to the same subnet for proper operation. The Wireless Telephone can change subnets if DHCP is enabled and the Wireless Telephone is powered off, then back on, when within range of access points on the new subnet.

ESSID

Select the option that will enable the Wireless Telephone to acquire access points with the correct ESSID (Extended Service Set ID, aka SSID) each time it is turned on.

***Learn Once**: allows the Wireless Telephone to scan all ESSs for its NetLink Telephony Gateway. Once the NetLink Telephony Gateway is found, the Wireless Telephone retains the ESSID from whichever access point it associates with at that point. When overlapping wireless systems exist, the Learn Once feature allows the Wireless Telephone to power on in any ESSID area and use only the ESSID established at first learn. This ESSID is retained by the Wireless Telephone until the ESSID option is reselected.

Learn Always: allows the Wireless Telephone to automatically learn the ESSID at each power on. This may be useful if the Wireless Telephone will be used at more than one site.

Note about Automatic Learn options: Overlapping wireless systems complicate the use of ESSID learning as the Wireless Telephone in an overlapping area could receive conflicting signals. If this is the situation at your site, use Static Entry or Learn Once in an area without overlapping ESSIDs. Broadcast ESSID must be enabled in the access points for ESSID learning to function. Refer to the *Configuration Note* for your access point or call your access point vendor for specifics.

Static Entry: If your access points do not accept broadcast ESSID or if there are overlapping wireless systems in use at the site, enter the correct ESSID manually following the alphanumeric string entry technique.

License Management

License Management lets you select the VoIP protocol that your site is licensed to download and run. The SpectraLink Radio Protocol (SRP used for the NetLink e340 and i640 Wireless Telephones in a NetLink Telephony Gateway system requires License Management Selection **007**. Any other protocol will cause the Wireless Telephone to malfunction.

After selecting the correct protocol for your site, you should upgrade the software for the phones. See *Upgrading Wireless Telephones* section for more information.

Restore Defaults

The Restore Defaults option will set all user and administrative parameters to their factory defaults.

Site Survey Mode

Site Survey Mode is used to check the signal strength from access points. When you select Site Survey Mode, the Wireless Telephone will remain in this mode until it is powered off. See *Certifying the NetLink Wireless Telephones* section for more information on this mode.

Regulatory Domain

The Regulatory Domain used to identify the region in which the Wireless Telephone will operate, will default to North America on the Wireless Telephone display. FCC requirements dictate that the menu for changing the domain be available by password, which for the NetLink Wireless Telephones is the **LINE** button. To change the domain, press **LINE** and then enter the digits that represent the site's domain. Note that both digits must be entered.

01 - North America

02 - Europe (except Spain and France); Japan (channels 1-13)

04 - Spain

05 - France

Security

***NONE** disables any 802.11 encryption or security authentication mechanisms.

WEP (Wired Equivalent Privacy) is a wireless encryption protocol that scrambles wireless signals allowing for greater security in the wireless network. If WEP/Encryption is required at this site, you must configure each Wireless Telephone to correspond with the encryption protocol set up in the access points. Select the entries from the options below to enable the Wireless Telephone to acquire the system.

Set each of these options to match exactly the settings in your APs.

Encryption codes display as they are entered. For security reasons codes will not display when a user returns to the Admin menu, Encryption options.

Note that WEP may be set to "optional" at the AP if there are wireless devices in use that do not have WEP capability. All wireless devices must be upgraded to WEP capability for a fully secured WEP environment.

Authentication
Select either **Open System** or **Shared Key**.

WEP
Select either **WEP Off** or **WEP On**.

Key Information
Press the right arrow key to scroll through the options:

Default Key: Enter the key # specified for use by the Wireless Telephones. This will be 1 through 4.

Key Length: Select either **40-bit** or **128-bit** depending on the key length specified for use at this location.

Key 1-4: Scroll to the key option that corresponds to the **Default Key** that was entered above. Enter the encryption key as a sequence of hexadecimal characters. (Use the **2** and **3** keys to access hexadecimal digits A-F, use the left arrow key to backspace.) For 40-bit keys you will need to enter 10 digits, for 128-bit keys you will need to enter 26 digits. The display will scroll as needed.

Rotation Secret: This is used for proprietary WEP key rotation. Refer to your custom document if this feature is supported in your system.

Cisco FSR (Fast Secure Roaming) In order to provide the highest level of security without compromising voice quality on Cisco Aironet wireless LAN access points, SpectraLink and Cisco Systems have cooperated to implement the Fast Secure Roaming mechanism. FSR is designed to minimize call interruptions for NetLink Wireless Telephone users as they roam throughout a facility. Existing Aironet 350, 1100 and 1200 APs may require a firmware upgrade to support FSR. Cisco FSR requires advanced configuration of the Cisco access points in your site. See your Cisco representative for detailed documentation on configuring your access points and other required security services on your wired network. To configure Cisco FSR in your Wireless Telephone, you must enter a Radius Server username and password into each phone.

Username: Enter a username that matches an entry on your Radius server. Usernames are alphanumeric strings, and can be entered using the alphanumeric string entry technique.

Password: Enter the password that corresponds to this Username.

Admin PW

The Admin PW (password) controls access to the administration functions in the Admin menu. The password must be set in each Wireless Telephone for which controlled access is desired. Wireless Telephones are shipped without any Admin menu password. Data entry for the password uses the alphanumeric string entry technique.

If you exit with no entry, the password is erased and the display will not require it before displaying the Admin menu.

3.2 User-defined Preferences

The following user-defined preferences are also covered in the NetLink e340 and NetLink i640 Wireless Telephone user guides. The system administrator can refer to this list for more information about customizing Wireless Telephone settings.

To configure the following options, the Wireless Telephone must acquire the system (no error message may display) and be in standby mode at the extension display. This is the standby state. While in the standby state, press and hold **FCN** briefly to open the user options menu. Use the following keys to display and select options:

Up/Down buttons: display previous/next menu item.
Select button: selects the menu item or option.
OK softkey selects the menu item or option.
Save softkey: saves the entry.
Bksp softkey: backspaces to allow editing of entry.
Cncl softkey: cancels edit and returns to previous menu level.
Up softkey: returns to previous menu level.
Exit softkey: exits the menu (at the top level).
End Call key: exits to standby state (from any level)

Standby menu item	2nd Level	3rd Level
Ring Type	Telephone ring	Normal Ring Vibrate Ring Vib/Norm
	Auxiliary ring 1	
	Auxiliary ring 2	
Noise Mode	Normal High Severe	
Current IP Addr		
Extension		
Push-to-Talk	Channel	1-8
	Enable/Disable	Enable Disable

Ring Type: Select **Ring Type** then **Telephone Ring** to change the standard ring used for normal operation. From the **Telephone Ring** menu, select either **Normal Ring** (an audible alert), **Vibrate Ring** or **Vib/Norm Ring** (vibrate for five seconds and then audible alert for subsequent rings). The **Auxiliary Ring** modes are reserved for future use. The ring type currently in use displays with an asterisk (*).

Noise Mode: Provides options that describe the noise level in your environment. Selecting the correct option will adjust the Wireless Telephone to account for background noise. Select **Normal**: for most office environments; **High**: for moderate background noise; or **Severe**: for extremely noisy conditions. Use of the non-Normal modes is not recommended unless you

are in a loud environment or you may find it difficult to be heard on your Wireless Telephone.

Current IP Addr: Displays the IP address currently assigned to the Wireless Telephone. The IP address is not set here, it is merely displayed and may not be changed.

Extension: Allows you to enter the user extension for this Wireless Telephone. This number is for display purposes only, entering it does not assign the extension in the host telephone system.

Push-to-talk: Displays the menu for the two way radio feature in the NetLink i640 Wireless Telephone. The **Channel** option allows you to select a channel 1-8 to send and receive radio messages. The **Enable/Disable** option allows you to enable or disable the radio feature. See the NetLink i640 Wireless Telephone end user document for more information about push-to-talk.

(Additional options may be present. Contact your system administrator for information.)

4. License Management

The NetLink Wireless Telephone system supports a number of different IP protocol integrations. All NetLink e340 and i640 Wireless Telephones are shipped from SpectraLink with a generic software load that allows them to associate to a wireless LAN and download their functional software from a TFTP server. **The Wireless Telephones will not function properly without downloading appropriate software.**

The following details the process to properly configure NetLink Wireless Telephones and download software via over-the-air file transfer.

4.1 Requirements

- A wireless LAN must be properly configured and operational through the use of 802.11b wireless access points.
- NetLink Telephony Gateway must also be connected to your network and completely operational, and the handset must be registered to it.
- The NetLink Telephony Gateways have a TFTP Server and must be available on the network in order to load the appropriate software into the Wireless Telephones. Most installations choose to take advantage of the TFTP Server that accompanies the NetLink Telephony Gateway, making a separate TFTP Server unnecessary.
- Finally, ensure that the Battery Pack on the Wireless Telephone is fully charged.

4.2 Configuration Process

1. Download the latest NetLink Wireless Telephone software from http://www.spectralink.com/service/software.php

2. Place the latest version of the NetLink e340 or i640 Wireless Telephone SRP code on the TFTP Server and ensure the TFTP Server is started. The two files that are needed must be named
   pd11spc.bin
   phintl24.bin.
   See *NetLink Telephony Gateway Installation, Setup, and Maintenance* to set the TFTP Server information and/or use the NetLink Telephony Gateway's built-in TFTP Server.

3. If statically assigning IP addresses, ensure that the **IP Address**, **Subnet Mask**, and **Default Gateway** information are accurate in the Admin Menu. If using a DHCP Server, ensure that the DHCP option is set. See section 3 "NetLink Wireless Telephone Configuration" for detailed configuration instructions.

4. Ensure the Wireless Telephone has properly configured **ESSID** and **Reg Domain** Information within the Admin Menu. If you are accepting broadcast **ESSIDs** at your access points, the handset will automatically learn the ESSID information when powering on. See section 3 "NetLink Wireless Telephone Configuration" for detailed configuration instructions.

5. Using the Admin Menu on the Wireless Telephone, ensure the **License Mngt** menu option is set to **007**. This ensures the handset will check for the proper SRP files each time it powers on. See section 3 "NetLink Wireless Telephone Configuration" for detailed configuration instructions.

6. Power cycle the Wireless Telephone.

7. The SRP code will now download to the handset. The status bar will increment fully across the display for each function that is being performed in the download process. Upon completion of the update process, the handset will re-boot with the new firmware.

For future software upgrades, simply update the files that are stored on the TFTP Server. Each time the Wireless Telephone is powered up, it will check with the TFTP Server to ensure it has the proper software version.

5. Testing a Wireless Telephone

Verify proper registration and operation of each Wireless Telephone by performing the following tests on the Wireless Telephone in an active wireless area.

1. Power on the Wireless Telephone by pressing **Power On**. You will see a series of messages displayed as the Wireless Telephone acquires the system. The Wireless Telephone should display the user extension or dashes if no extension is programmed. Any error messages should clear.
2. Press the **Start Call** key. The extension number should clear and you should hear dial tone. On some digital systems, depending on how the telephone system is programmed, you may have to select a line to get dial tone. Place a call and listen to the audio quality. End the call by pressing the **End Call** key.
3. Place a call to the Wireless Telephone and verify ring, answer, clear transmit, and clear receive audio.
4. Use the **FCN** key to verify all softkey programmed features on the Wireless Telephone. Use the **MENU** key and scroll through the Shortcut Menu. Ensure the features displayed on the Shortcut Menu match those displayed in the softkey function display area.
5. Press the **End Call** key. Any line indicators should turn off and the extension number display will return.

If any of these steps fails to operate as described, refer to the *Troubleshooting* section for corrective action.

6. Certifying the NetLink e340 and i640 Wireless Telephones

Conduct a preliminary Site Survey Mode test according to the directions given below. Note any areas where coverage is conflicting or inadequate. Note any system difficulties and work with your wireless LAN and/or LAN system administrator to determine the cause and possible remedy. See the section *Wireless Telephone Problems* for clues to possible sources of difficulties.

6.1 Site Certification

The installer should not leave the site before performing installation verification.

These tests must be performed in typical operating conditions, especially if heavy loads occur. Testing sequence and procedure is different for every installation. Generally, you should organize the test according to area and volume, placing numerous calls to others who can listen while you perform coverage tests. Note any areas with excessive static or clarity problems and report it to a SpectraLink service engineer.

The coverage test will also require you to put the Wireless Telephone in **Site Survey** mode and walk the entire coverage area to verify all access points.

The NetLink Wireless Telephone performing the site survey must be configured for ESSID Learn Once or Static. Site survey mode is not available in Learn Always.

The installation is not complete until these certification steps have been performed. Do not hand out Wireless Telephones at a site that has not been certified.

6.2 Site Survey Mode

Test signal strength in the covered area by performing a Site Survey. Put a Wireless Telephone in Site Survey mode (see *Wireless Telephone Configuration* section) and walk the entire coverage area while viewing the display.

The **FCN** key toggles between the three coverage modes described below. The Wireless Telephone will remain in Site Survey mode until it is powered off. When testing is complete, press **Power Off / End Call** to power off the Wireless Telephone.

Numbers racing across the Wireless Telephone display indicate AP information is being obtained. A **Waiting** message indicates the system is not configured properly and the Wireless Telephone cannot find any APs.

Detect dBm coverage

As you walk the coverage area, the two-line display will show the top four access points that the Wireless Telephone can contact in a code as illustrated below.

```
XXX1  YY  XXX2 YY
XXX3  YY  XXX4 YY
-dBm
```

- XXX1 through XXX4 are the last four digits of the access points' MAC address. The primary access point (the access point which had the strongest signal to this Wireless Telephone) displays first, followed by the three access points with the next strongest signals.
- YY is the power level in dBm at which this Wireless Telephone detected the associated access point. Although shown as a positive number, YY represents negative dBm and lower numbers represent stronger signals. For example, a displayed value of 40 indicates –40dBm, and is therefore a stronger signal then a display of 50 (which indicates –50dBm). At least one access point's reading should be stronger than -70 dBm in all areas.

Note any areas that have inadequate dBm readings.

Detect overlap or conflicts

Press **FCN** to toggle to the Site Survey function that shows the channel number of the access points. Use this information to detect overlaps or conflicts in access point signaling.

```
XXX1  ZZ  XXX2 ZZ
XXX3  ZZ  XXX4 ZZ
Chnl
```

- XXX1 through XXX4 are the last four digits of the access points' MAC address.
- ZZ is the channel number (or hopping pattern for FH Wireless Telephones) that the access point is using.

Note any areas that have access points that are in contention for the same channel.

It is preferable that no overlaps exist anywhere in your facility. If the site survey mode indicates two APs using the same channel, then at least one other AP must be indicated at 10 dBm stronger than those APs to avoid channel conflicts.

Confirm Supported Data Rates

Press **FCN** to toggle to the Detail function. Use this information to confirm signal strength and supported data rates.

```
#:        Full MAC
dB  Ch  1b2b5b11b
Detl
```

- #: the number (1-4) of the AP.
- Full MAC: the MAC address of the AP
- dB: the signal strength of the AP
- Ch: the channel of the AP
- 1b2b5b11b is an example of the data rates that may be displayed.

Walk around the site to determine supported data rates, one AP at a time. In any location you may use the right arrow key to display the second best AP, arrow again to the third best, and so on to the fourth best. The left arrow key steps you back to the first best.

Each data rate (1, 2, 5.5, or 11Mbs) that is supported by the AP is shown. Those rates that are in the Basic Rate set (sometimes referred to as "required" rates) are indicated by a 'b' following the rate number. The Supported and Basic data rate(s) should be the same on all APs as is appropriate for your environment.

6.3 Solving Coverage Issues

Coverage issues are best resolved by adding and/or relocating access points.

Overlap issues may be resolved by reassigning channels to the access points or by relocating the access points.

7. Software Maintenance

The NetLink e340 and i640 Wireless Telephones use proprietary software programs written and maintained by SpectraLink Corporation. The software versions that are running on the Wireless Telephones can be displayed during power on by holding down the **Power On** button.

SpectraLink or its authorized dealer will provide information about software updates and how to obtain the software (for example, downloading updates from a web site).

Upgrading Wireless Telephones

After software updates are obtained from SpectraLink, they must be transferred to the NetLink Telephony Gateway or other TFTP server. See *NetLink Telephony Gateway: Setup and Maintenance* for an explanation of how to update the Wireless Telephone software in the NetLink Telephony Gateway so that it can then be downloaded into the Wireless Telephones.

NetLink Wireless Telephones allow over-the-air transfer of software updates from the NetLink Telephony Gateway to the Wireless Telephones. The downloader function in the Wireless Telephone checks its software version every time the Wireless Telephone is turned on. If there is any discrepancy the Wireless Telephone immediately begins to download the update.

Normal Download Messages

When the Wireless Telephone is powered on, it displays a series of messages indicating that it is searching for new software, checking the versions, and downloading. The normal message progression is:

Checking Code
Erasing Memory
Updating Code

See the *Troubleshooting* section for more information about each of these messages.

When the update is complete, the Wireless Telephone displays the extension number, and is ready for use.

Download Failure or Recovery Messages

The following display messages indicate a failure or recovery situation during the download process. See the *Troubleshooting* section for more information about each message.

Server Busy
TFTP ERROR(x):yy
Erase Failed
Waiting
(Internal Errors)

8. Troubleshooting

NetLink e340 and i640 Wireless Telephones can exhibit transmission problems in several ways. They can cease functioning properly, display error messages, or display incorrect data. When using and troubleshooting Wireless Telephones, consider the following problem sources to determine the best method of approaching any specific situation.

8.1 Access Point Problems

Most, but not all, Wireless Telephone audio problems have to do with access point range, positioning and capacity. Performing a Site Survey as described above can isolate the access point causing these types of problems. If the Wireless Telephone itself is suspected, conduct a parallel Site Survey with a Wireless Telephone that is known to be properly functioning.

In range/Out of range – service will be disrupted if a user moves outside the area covered by the wireless LAN access points. Service is restored if the user moves back within range. If a call drops because a user moves out of range, the Wireless Telephone will recover the call if the user moves back into range within a few seconds.

Capacity – in areas of heavy use, the call capacity of a particular access point may be filled. If this happens, the user will hear three chirps from the Wireless Telephone. The user can wait until another user terminates a call, or move within range of another access point and try the call again. If a user is on a call and moves into an area where capacity is full, the system attempts to find another access point. Due to range limitations, this may be the same as moving out of range.

Transmission Obstructions –prior to system installation, the best location for access points for optimum transmission coverage was determined. However, small pockets of obstruction may still be present, or obstructions may be introduced into the facility after system installation. This loss of service can be restored by moving out of the obstructed area, or by adding access points.

8.2 Configuration Problems

Certain problems are associated with improper configuration of either the NetLink Telephony Gateway, Wireless Telephone, or NetLink SVP Server.

For instance, no extension displayed or wrong extension displayed on the Wireless Telephone has no effect on its operation but serves to easily identify it. Other configuration problems, like having incorrect menu items, or inability to connect or access telephone system features, affect the Wireless Telephone's functioning.

Configuration problems are generally corrected by changing the configuration at the NetLink Telephony Gateway, the NetLink SVP Server, or on the Wireless Telephone. See the *NetLink Telephony Gateway: Installation, Setup, and Maintenance* document for specific configuration steps. There may also be incorrect programming of the PBX or

access point. See the appropriate *LinkPlus Integration Guide* or the *Configuration Note* for the access point in use at the site.

8.3 Infrastructure Problems

Calls ringing on the wrong Wireless Telephone, or multiple Wireless Telephones not working, are likely to be caused by faulty installation. The wires that connect the demarcation (demarc) block to the NetLink Telephony Gateway could be installed incorrectly.

Contact your wireless LAN and/or PBX vendor for more information about troubleshooting infrastructure problems.

8.4 Dialtone Problems

A dialtone problem exists if the Wireless Telephone has no dialtone, or if the user is unable to hear the other party's voice, hears echo or hears dead air. Dialtone problems can be caused by a number of different situations and should be investigated by following these steps:

1. Power on the Wireless Telephone in an active service area. If the Wireless Telephone does not get a dialtone in an active area, continue with the steps below. If the no dialtone problem is limited to a certain area, see the *Access Point Problems* section.

   Any initialization or error messages should turn off a few seconds after the Wireless Telephone is powered on.
2. Swap the Battery Pack with a Battery Pack from a functional Wireless Telephone, power the Wireless Telephone back on and check for dialtone. If this corrects the problem, charge the Battery Pack that was removed.
3. Turn the Wireless Telephone off, then on again, and then test again for dialtone. If OK, place a call and determine voice quality.
4. While maintaining an active call, walk through several access point areas. If fluctuation occurs see the Access Point Problems section.
5. Check for alarms on the NetLink Telephony Gateway or the NetLink SVP Server (via System Status). If there are alarms, see Error Status for information.
6. Make sure the Wireless Telephone's gateway port is connected to a working phone line. Check the line at the demarc block. You may need to contact your vendor to perform this check.
7. Check the cabling between the gateway and the demarc block, and between the demarc block and the telephone system ports.
8. Move the Wireless Telephone to a different port location and test again.

8.5 Wireless Telephone Status Messages

Wireless Telephone status messages provide information about the NetLink e340 and i640 Wireless Telephone's communication with the access point and host telephone system. The following table summarizes the status messages, in alphabetical order.

Message	Description	Action
3 chirps (audio)	Wireless Telephone is not able to communicate with the best AP, probably because that AP has no bandwidth available.	None. This is only a warning, the call will handoff to the best AP once it becomes available.
(battery icon), Low Battery, beep (audio)	Low battery	In call: the battery icon displays and a soft beep will be heard when the user is on the Wireless Telephone and the battery charge is low. User has 15–30 minutes of battery life left. The Battery Pack can be changed while the call is still in progress. Do not press **End Call**. Quickly remove the discharged battery and replace with a charged battery, power on the Wireless Telephone, and press **Start Call** to resume the call in progress. Not in call: The battery icon displays whenever the Battery Pack charge is low The message Low Battery and a loud beep indicate a critically low battery charge when user is not on the Wireless Telephone. The Wireless Telephone will not work until the Battery Pack is charged.
Battery Failure	The Battery Pack is not functioning.	Replace the Battery Pack with a new or confirmed SpectraLink Battery pack. Any non-SpectraLink Battery Packs will not work.
Charging …	The Wireless Telephone is charging in the Desktop Charger	No action needed
Charge Complete	The Wireless Telephone is now fully charged	No action needed
Checking Code	Wireless Telephone is contacting the Download Master to determine if it has a newer version of software that should be downloaded.	None, this message should only last for approximately one second. If message remains displayed, power off and contact customer support for a replacement phone.

Message	Description	Action
DHCP Error (1-4)	DHCP Error 1	The Wireless Telephone cannot locate a DHCP server. It will try every 4 seconds until a server is located.
	DHCP Error 2	The Wireless Telephone has not received a response from the server for a request for an IP address. It will retry until a server is found.
	DHCP Error 3	The server refuses to lease the Wireless Telephone an IP address. It will keep trying.
	DHCP Error 4	The server offered the Wireless Telephone a lease that is too short. The minimum lease time is 10 minutes but SpectraLink engineers recommend at least one hour minimum lease time. The Wireless Telephone will stop trying. Reconfigure the server and power cycle the Wireless Telephone.
Erase Failed	Download process failed to erase the memory in the Wireless Telephone. This operation will retry.	Operation will retry but may eventually report the error "int. error: 0F". Power cycle the phone.
Erasing Memory	Wireless Telephone has determined that a download should occur and is erasing the current software from memory. This message also displays a progress bar. When the progress bar fills the display line the erase operation is complete.	None. When the progress bar fills the display line the erase operation is complete. Do not turn the Wireless Telephone off during this operation.
Internal Err. # #	The Wireless Telephone has detected a fault from which it cannot recover. OE = Error while writing the Flash (return Wireless Telephone to factory) OF = No functional code (contact SpectraLink Technical Support)	Record the error code so it can be reported. Turn the Wireless Telephone off then on again. If error persists, try registering a different Wireless Telephone to this telephone port. If error still persists, contact SpectraLink Technical Support and report the error.
Multiple GW regs	The Wireless Telephone has discovered more than one Telephony Gateway that is configured with the Telephone's MAC address.	Check each NetLink Telephony Gateway for the Wireless Telephone's MAC address on the Telephone Line Configuration screen. Delete any duplicate entries leaving only one entry on the correct Telephone Gateway and port for this Wireless Telephone.

Message	Description	Action
Network Busy	All APs are full or busy	Try the call again later.
No GW Response	Wireless Telephone not registered on NetLink Telephony Gateway	Verify that the NetLink Telephony Gateway is properly configured.
	NetLink Telephony Gateway is not working	Verify that the NetLink Telephony Gateway is powered on. If so, follow standard NetLink Telephony Gateway troubleshooting procedures.
	No LAN connection at the AP or NetLink Telephony Gateway	Verify NetLink Telephony Gateway connection to LAN and all APs.
No IP Address	Invalid IP	Check the IP address of the Wireless Telephone and re-configure if required.
No Net Access	Cannot authenticate / associate with AP	Verify the AP configuration. Verify that all the WEP settings in the Wireless Telephone match those in the APs.
No Net Found	This indicates any of the following:	
	• No radio link	Verify that the AP is turned on.
	• No ESSID – Auto-learn not supported (or) • Incorrect ESSID	Verify the ESSID of the wireless LAN and enter or Auto-learn it again if required. See *Wireless Telephone Configuration* section.
	• AP does not support appropriate data rates	Check the AP configuration against *Configuration Note* for AP.
	• Out of range	Try getting closer to an AP. Check to see if other Wireless Telephones are working within the same range of an AP. If so, check the ESSID of this Wireless Telephone.
	• Incorrect WEP settings	Verify that all the WEP settings in the Wireless Telephone match those in the APs.
No Reg Domain	Regulatory Domain not set	Configure the Regulatory Domain of the Wireless Telephone
No PBX	No communication with host telephone system.	Displays before the system has synchronized ports with the host telephone system. Should disappear when the ports are correctly wired and programmed. Make sure the proper PBX switch has been selected within the NetLink Telephony Gateway.

Message	Description	Action
Server Busy	Wireless Telephone is attempting to download from a Download Master that is busy downloading other handsets and refusing additional downloads.	None, the Wireless Telephone will automatically retry the download every few seconds.
System Locked (with Busy Tone)	System is locked	Try the call again, system has been locked for maintenance
System Busy (with Busy Tone)	System is busy or out of resources	All call paths are in use, try the call again in a few minutes.
TFTP ERROR(x):yy	A failure has occurred during a TFTP software download. (x) = The file number which was being downloaded; yy is an error code describing the particular failure. Possible error codes are: 01 = TFTP server did not find the requested file. 02 = Access violation (reported from TFTP server). 07 = TFTP server reported "No such user" error. 81 = File put into memory did not CRC. FF = Timeout error. TFTP server did not respond within a specified period of time.	Error code 01, 02 or 07 - check the TFTP server configuration. Error code 81, the Wireless Telephone will attempt to download the file again. For other messages, power off the Wireless Telephone, then turn it on again to retry the download. If the error repeats, note it and contact SpectraLink Technical Support.
Updating Code	Wireless Telephone is downloading new software into memory. The number icons at the bottom of the display indicate which file number is currently being downloaded. This message also displays a progress bar. When the progress bar fills the display line the update operation is complete on that file.	None. When the progress bar fills the display line the update operation is complete on that file. Do not turn the Wireless Telephone off during this operation.
Waiting	Wireless Telephone has attempted some operation several times and failed, and is now waiting for a period of time before attempting that operation again.	None. The Wireless Telephone is waiting for a specified period of time before attempting that operation again.

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